A CATCH

The present invention relates to the field of catches. More specifically, the present invention relates to the field of catches for doors (sliding or hinged), windows, drawers, grilles etc.

Sliding doors, grilles, windows etc. suffer from the problem that they can often be easily forced opened by prising the sliding members, i. e. doors, grilles etc. apart. This problem is also encountered in hinged doors, windows, etc. as these are also prone to opening by prising the catch / lock mechanism open which secures the hinged door.

Previously, security devices have been suggested for sliding grilles etc. which prevent the sliding panels being pulled apart to a certain extent. For example, Australian patent AU-27145/95 discloses a device which has inter-engaging teeth which partially prevent sliding grilles from being prised apart. However, under such a force, these teeth will break rendering the security device useless.

The present invention addresses the above problems and, in a first aspect, provides a catch assembly for securing first and second members,

the assembly comprising first and second catch members attachable to the first and second members respectively, each catch member having a projection portion located on a shaft, the projections of the first and second catch members being engageable with one another when the first and second catch members are in a locked position, the first and second shaft portions being flexible, such that as the members are moved apart or together when the catch members are in the locked position, the shafts flex to keep the projections engaged with one another.

The provision of the flexible shafts allows the catch to withstand a greater force prising the first and second members apart. Generally, the shaft of each catch member flexes such that as the first and second members are moved apart, the shaft flexes away from the member to which it is attached.

As the first and second members are moved, the catch members, or preferably the shafts of the catch members, elastically deform to keep the projections engaged. The shafts of the catch members preferably flex to keep the projections engaged as the first and second members are moved apart or even as they are moved together. The catch members or shafts will deform elastically up to a point, then they will preferably plastically deform. This plastic deformation is used advantageously to provide a secure catch.

Preferably, the catch members or at least the shafts of the catch members will comprise metal or plastics. More preferably, they will comprise at least one of the following UPVC, aluminium, iron or stainless steel. A material with a modulus of preferably at lease $62GNm^{-2}$ (9×10^6 psi) is required, more preferably at least $103GNm^{-2}$ (15×10^6 psi), even more preferably at least $138GNm^{-2}$ (20×10^6 psi).

The above materials or materials with the above elastic properties also satisfy the plastic deformation properties preferably required by the present invention. For example, aluminium 6061-T6 has a Young's modulus of $70GNm^{-2}$ (10.2×10^6 psi) ductile Iron is between 170 and $176GNm^{-2} \times 10^6$ psi and stainless steel 18.8 is $190GNm^{-2}$ (27.6×10^6 psi). In general, a force of more than double these values is required to cause plastic deformation.

The shafts flex as the first and second members moved apart or pushed together, the shafts preferably are capable of moving through at lease 25° from their rest position as they flex, more preferably, the shafts can move through at least 30° from their rest position.

If the first and second members are being moved apart, for example, if they are prised apart, the separation between the first and second members increases and the shafts flex to maintain the projections in contact. As there is now larger separation between the first and second members, it is difficult to maintain

application of a strong prising force. For example, if the shafts flex is more than 25°, it is very difficult to apply an effective prising force.

Preferably, the shaft is "L" shaped. One end of this shaft is connected to the member and the projection is located at the other end of the shaft i. e. the free end. As the shafts flex, preferably, the angle at the corner of the "L" shape varies, for example it increases if the members are pulled apart. If the first and second members are pushed together, the angle at the corner of "L" should also increase. More preferably, the first and second catch members are positioned so that they can slide easily over one another when the members are in an unlocked position and engage with each other when the members are in a locked position.

Of course, the shaft does not need to be L-shaped, it could be curved.

The members may be provided with a plurality of catches. Preferably, such catches extend along a whole length of the member to strengthen the entire sliding assembly against unauthorised opening of the doors, grille, windows etc. Also, if one of the catches opens, the remaining catches will hold the first and second members together.

The provision of a plurality of catch members provides far greater security. If the members are pulled apart at a certain point such that they plastically deform at that point, the other members which were not prised apart will remain in their rest position. This line of catches where some of the members are permanently plastically deformed and others are not, gives rise to an irregular line of catches (a wave like structure) which prevents opening of the first and second members. It is not possible to bend the catches which have been permanently deformed back into position without bending another catch out of position. Also, the catch which has deformed will further deform in an attempt to straight it by moving the first and second members.

In the sliding member assembly, one or both of the first and second members may be slidable.

The first and second members to which the catch members are attached can be members which slide relative to one another, for example the first and second members may be sliding doors alternatively, the second member may be a fixed member and the first member may slide relative to the first member, for example, the second member may be a door post, window frame, drawer support etc. and the first member may be a door, sliding window, or drawer respectively.

Thus, in a second aspect, the present invention provides a sliding member assembly comprising first and second members wherein at least one member slides relative to the other member and a catch assembly, the catch assembly comprising first and second catch members attachable to the first and second members respectively, each catch member having a projection portion located on a shaft, the projections of the first and second catch members being engageable with one another when the first and second catch members are in a locked position, the first and second shaft portions being flexible, such that as the members are moved apart or together when the catch members are in the locked position, the shafts flex to keep the projections engaged with one another.

In the case where the two members slide relative to each other, at least one of the members may be substantially planar, at least one of the catch members may be attached to the planar face of one of the members which faces the other of the first and second members.

Also, one of the catch members may be attached to the edge or close to the edge of one of the members.

In a preferred arrangement, a catch member is provided on opposite sides of the first sliding member, each of the catch members of the sliding member being engageable with catch members located on one or two second members.

Alternatively, the catch may be used with hinged or so-called swing doors, windows or the like. In this type of arrangement, the second member is hingeably attached to a fixed member such as a door frame etc. The door / window assembly locks by securing the second member to a first member.

Thus, in a third aspect, the present invention provides a hinged member assembly comprising first and second members, wherein the first member is a hinged member and is capable of being secured in a closed position to the second member, the assembly further comprising a catch assembly for securing the first and second members together, the catch assembly comprising first and second catch members attachable to the first and second members respectively, each catch member having a projection portion located on a shaft, the projections of the first and second catch members being engageable with one another when the first and second catch members are in a locked position, the first and second shaft portions being flexible, such that as the members are moved apart or together when the catch members are in the locked position, the shafts flex to keep the projections engaged with one another. In the hinged member assembly, one or both of the first and second members may be hinged.

The first and second members may be only separated by a small distance when in the locked position. Hence, large instruments cannot be used to prise open the two members. Preferably, the minimum distance between the first and second members is twice the size of the catch members such that the catch members can move over one another in a unlocked position. Preferably, the first and second members will be at least 4mm apart, possibly at least 10mm apart.

Preferably, the arrangement further comprises a lock member which moves the first and second catch members into the locked position.

In the locked position, the projections of the first and second catch members interengage. Thus, in order to lock the catch members, the projections must be brought into contact. The lock member may affect movement of the catch

members themselves. Alternatively, it could cause movement of the first and second members as well as the catch members.

As previously mentioned preferably, a plurality of catch members are provided. In this situation, it is preferable if at least one catch is orientated in a first orientation and at least one other catch is oriented in a second orientation.

More preferably, the first orientation is opposite to the second orientation. This has the advantage that regardless of which sides of the catch are prised apart, the plurality of catches will still hold the device together.

Advantageously, there may be a plurality of catches with the first orientation and a plurality of catches with the second orientation, the catches having the first of orientation are alternately arranged with the catches having the second orientation.

The catch assembly can be fitted to the first and second members via glue, nails, screws etc. Alternatively, the catch members may be integral with at least one of the first and second members. The catch members could also clip, for example, to an edge of the first and / or second members.

The present invention will now be described with reference to the following preferred embodiment in which :

Figure 1 shows an embodiment of the present invention with a catch in an open position;

Figure 2 shows the embodiment of Figure 1 with the catch in a closed position;

Figure 3 shows the catch of Figures 1 and 2 when the members are prised apart;

Figure 4 shows the catch of Figures 1 to 3 which has been prised open;

Figure 5 shows the catch of Figures 1 to 4 which has been squashed;

Figure 6 shows two members which are slidable relative to each other with a plurality of catches in accordance with the present invention;

Figure 7 shows two slidable members with a plurality of catches alternatively arranged in opposite directions;

Figure 8 shows a schematic plan view of the catch shown in Figures 1 to 5 applied to sliding windows;

Figures 9a to 9b show a drawer using the catch of members 1 to 5; and

Figures 10a to 10c show the catch of Figures 1 to 5 applied to a swing door.

Figure 1 shows a catch 1 which is attached to a first member 3 and a second member 5. The second member 5 is slidable in a first sliding direction 7 relative to the first member 3. The catch 1 has a first catch member 9 and a second catch member 11. The first catch member 9 has an L shaped shaft 13 which is integral with the first sliding member (3) at one end 15. A first projection 17 is located at the other end of shaft 13. A first projection 17 is also integral with shaft 13 at its free end

Similarly, second catch member 11 comprises an L shaped shaft 19 and a second projection 21. The second catch member 11 is similar in construction to the first catch member 9, but is rotated through 180° to the first catch member 9. The distance (d) between the first 3 and second 5 members is such that the second

member 5 can freely slide in the first sliding direction 7 relative to the first member.

In Figure 1, the catch is shown in the unlocked position, i. e. the projection 17, 21 are not interengaged with each other. The catch may be moved into the locked position by lock member 4. In this particular example, lock member 4 acts to pull the first catch 9 towards itself such that the projection 17 and 21 interengage. Alternatively, lock member 4 could work by pushing the elongate part 12 of shaft member 11 away from the lock member 4. This also allows the first and second projections 17 and 21 to engage.

Figure 2 shows the catch member in its locked position. The lock member 4 is not shown here, the separation distance (d) between the first member 3 and the second member 5 is increased such that the first and second projections 17, 21 engage with one another. Inner surfaces 29, 31 of the two projections 17, 21 about one another such that the second member 5 cannot be moved along first sliding direction 7. Hence, the sliding assembly is in a locked position.

Figure 3 shows the arrangement of Figure 2 where the first member 3 and the second member 5 are prised apart to extend the separation distance (d). In this forced position, the angle 23 of the L shaped first and second shafts 13, 19 extends to greater than 90°. Also, the outside angle 25, 27 at which the first 13 and the second 19 shafts respectively meet the first 3 and second 5 members also extends to more than 90°. In this strained position, the abutting surfaces 29, 31 of the projections 17, 21 still engage with each other. Hence, the catch members 9, 11 still remain locked in the position holding the sliding assembly together.

Figure 4 shows the catch where the force applied to the catch members has exceeded the plastic deformation limit and the catch members have permanently deformed. This permanent deformation of the catch members also prevents the door from being open.

As has been previously described, preferably, the doors have been provided with a plurality of catches. Only the catches at the point where the force is applied will deform. Therefore, only a small part of the door will have catches which have plastically deformed. This deformation in just a small part of the door also causes the door to be prevented from opening.

Figure 5 shows a further safety feature of the catch. In this case, a force has been applied at an opposing end of the sliding members to that where the catches are. This causes the sliding members 3 and 5 to be pushed together. The catch members 9 and 11 are pushed together and plastically deform, here, the deformation is seen to occur in the shorter parts of the L-shaped shafts 9a and 11a and deformed in preference to the longer parts of the shafts 9b and 11b.

It will be preferred for the doors to be provided with a plurality of catches of the type shown in Figures 1 to 5. This is schematically shown in Figure 6. Here, only a part of the L section shaft 13, 19 is shown. If one of the catch member opens, the other catch members should remain shut so preventing the members 3, 5 from being prised apart.

It will be appreciated that there are preferential directions for providing the prising force. Figure 7 shows an arrangement wherein the catches 1 are alternately arranged such that the middle catch 41 is oppositely orientated with respect to adjacent catches 43, 45. Middle catch 41 is a mirror image through the centre of the catch 1 about the abutting surfaces 29, 31. This catch provides a very strong lock as there is no single preferential direction for applying prising force for all of the catches.

Figure 8 shows a sliding window arrangement. Window panes 101 and 103 can slide in directions 105 and 107. The window panes are supported by window frame 109. The window is shut when the window panes 105 and 107 are positioned so that they occupy the whole of the area defined by window frame 109. The furthest end 111, 113 of window panes 103, 101 from the window frame 109 when the

window is in the closed position each have a catch member 115, 117 of the type described with reference to Figures 1 to 5. Ideally, there is a plurality of catch members. However, for simplicity only one catch member is shown here. The window locks by moving the relative position of catch members 115, 117 into the locked position (Figure 2) such that the projection (not shown) on the catch members 115, 117 are interengaged.

If a trespasser attempts to get into the windows by prising open the furthest points of the panes 111, 113, then the catch members 115, 117 flex apart in the manner shown in Figure 3. However, if a force is applied where the window pane meets the frame 109, then this causes the catch members 115, 117 to be pushed together in the manner shown in Figure 5.

Figure 9 shows the catch of the present invention applied to a drawer. The drawer 121 is slidable relative to a housing 123, for example, a cabinet etc. The housing has drawer supports 125 and 127, a first catch member is located on both of the supports 125, 127. However, for simplicity, only the interaction of the drawer with one of the catch members will be described. The drawer 121 is provided with a catch member 129 which is intended to interlock with catch member 131 provided on support 125. The catch member 129 is provided on the side of the drawer 121 close to the front end of the drawer. The front end of the drawer 121 is defined as the end of the drawer which is visible when the drawer is shut. To shut the drawer, the drawer 121 is pushed backwards into the housing 123. When the drawer 121 is pushed into the closed position, the catch members 129 and 131 interengage on both sides of the drawer. Thus preventing removal of the drawer.

Figure 9b shows the drawer in the closed position within the housing 123. The catch can be configured so that the projections 129 and 131 automatically engage when the drawer 121 is pushed into position. Alternatively, a lock member or some other lock mechanism may be provided so that the catch members 129 and 131 only interengage when the lock is activated.

In Figure 9c, a screwdriver or other such implement is inserted into the catch mechanism to try to force open the drawer. The screwdriver 135 causes the right-hand catch members 131 and 129 to interengage more strongly. The drawer is pushed in the direction of the left-hand support 125. The catch members 129 and 131 on the right-hand side will interengage more strongly. As the drawer is pushed towards support 125, the left-hand catch members 129 and 131 are also interengaged more strongly. If the force applied to the drawer by screwdriver 135 is strong enough at least one of the catch members 129, 131 will plastically deform.

Figures 10a to 10c show the present invention applied to a hinged door. Figure 10a shows a hinged door 201 which is hingeably connected to fixed support 203. The door is closed when it is in line with fixed supports 205. The free end of the door 201, i. e. the end of the door which is opposite to a hinge 207 is provided with a first catch member 209. A second catch member 211 is provided on support 205.

Figure 10b shows the door when it is shut. The catch members 209 and 211 interlock to cause the door 201 to be locked into position in line with support 205 and 203.

The catch members 209 and 211 may interlock as the door is put into the closed position. Alternatively, a further lock may be provided to cause projections on catch members 209 and 211 to interengage. A screwdriver 213 can be used to push members 209 and 211 into the locked position. The screwdriver 213 cannot be used to prise open the catch members. As it will only force them more into engagement. Eventually, the catch members will start to plastically deform.